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INVESTIGATION OF THE APPLICATION OF  
HCMM THERMAL DATA TO SNOW HYDROLOGY

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## 1. INTRODUCTION

### 1.1 Objectives of Investigation

The objectives of the investigation of the application of HCMM thermal data to snow hydrology (HCMM Investigation No. 036) are as follows:

- (1) determine practical utility of HCMM thermal IR data to establish distribution of snow cover and determine accuracy of temperature measurements;
  - a. determine accuracy of surface temperatures acquired through use of HCMM thermal IR measurements,
  - b. determine relative resolution utility between VHRR and HCMM for thermal IR measurements, and
  - c. specifically delineate and quantify the problems involved with measuring snow temperature from space and relate them to present and planned earth observing satellite systems. This objective will take into consideration and utilize the capability of HCMM for day and night thermal measurements over appropriate sites and the satellite's eight-day repeat cycle;
- (2) determine if and how HCMM measurements can be factored in with Landsat data into an overall snow hydrology program related directly to snowmelt runoff prediction; and
- (3) develop an approach to automated data processing of combined visible and thermal infrared satellite acquired data to provide information of interest and use to the snow hydrologist.

### 1.2 Anticipated Results

The primary anticipated result of the proposed investigation is the development of improved techniques for the mapping and analysis of snow cover using spacecraft-acquired data. The results will provide an evaluation of the usefulness of high resolution thermal infrared data for snow mapping and for input to snowmelt prediction programs; and will provide a better understanding of the relationships between the measured

temperature values and such factors as type of snow, snow depth, type of terrain, and vegetation. The mapping and analysis techniques can then be applied to the automatic processing of data from future spacecraft systems, and will eventually enable snow survey, which is a vital part of water resources management, to be accomplished on a more cost-effective basis.

## 2. ACCOMPLISHMENTS DURING REPORTING PERIOD

During this reporting period priority requests for data (see attachment 1) were submitted for two test sites (Sierra Nevada and Arizona). Based on examination of the HCMM imagery, additional CCT data products have also been ordered for analysis of snowcover conditions in the Sierra Nevada test site. The CCT's were not received during this reporting period; however, we expect them in the near future. Analysis of the digital products will begin immediately upon receipt of the data.

Due to the impact of delays in HCMM data dissemination as discussed in the previous progress report, a proposal was submitted to the Contracting Officer on 18 May for additional time and funding for completion of the project. The proposal was approved, and a contract modification was received on 21 June. The revised schedule for the project is as follows: contract start date: 23 September 1977; new end date: 23 December 1979; final draft report due 23 October 1979; and final report due 23 December 1979. Two additional progress reports (30 June and 30 September) will be submitted.

## 3. PROBLEMS

With the contract modification for additional time and funding, we do not anticipate any problems in completing the study. However, completion of the remaining tasks is dependent upon timely receipt of the digital data products.

#### 4. PLANS FOR THE NEXT REPORTING PERIOD

We anticipate receiving the digital data for the second Sierras case during the next reporting period and will begin immediately on the analysis of these data. Additional priority CCT data requests will be submitted as a result of our review of the HCMM imagery received to date.

#### 5. TRAVEL

No travel directly related to the project occurred during this reporting period. A paper based on the project, discussed under Section 6 below, was presented at the Pecora Symposium; travel to the symposium was, however, funded by other ERT projects.

#### 6. PUBLICATIONS

A paper describing the objectives and initial results of this HCMM study was presented in a poster session of the Pecora Symposium held at Sioux Falls, South Dakota, 11-14 June. The presentation showed examples of daytime visible and infrared imagery as well as a portion of a daytime infrared CCT printout with snowcovered and non-snowcovered terrain delineated. The poster sessions were included in the Pecora program to provide an opportunity for informal discussion of studies that have not progressed to a point where results suitable for a formal paper have been found. Our paper presented at the poster session will not be published in the proceedings of the Symposium.

#### 7. SIGNIFICANT RESULTS

No significant results have been obtained through the seventh reporting period of the investigation.



## 8. FUNDS EXPENDED

With the contract modification received on 21 June, approximately 40 percent of the available funds have been expended to date. We anticipate that the remaining funds will be adequate to complete the project.